How to Write Scenarios?

Third US/Europe AP5-9 Practitioners' Workshop

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Topics

- Elements to take into account before writing scenarios
- Example of “tools” to describe scenarios

Scenarios are a means of communication between involved parties.

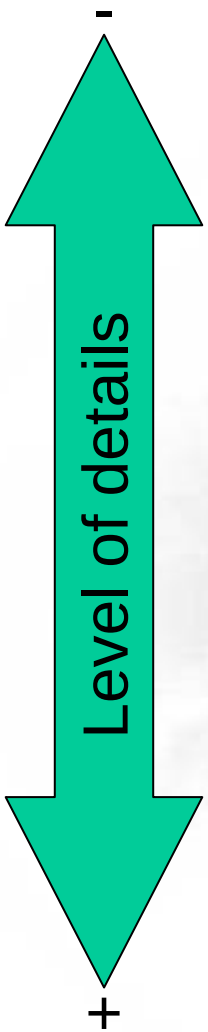
How do we Communicate?

- Written form
  - ➔ Description text
- Oral/Verbal form
  - ➔ Tape recording
  - ➔ Video
- Visual form
  - ➔ Drawing
  - ➔ Video recording
  - ➔ PowerPoint
  - ➔ Flash animation
  - ➔ …

Scenarios can use any communication form.

The form should be selected according to the audience and the purpose of the scenario : Advertisement, Training, In-depth description…

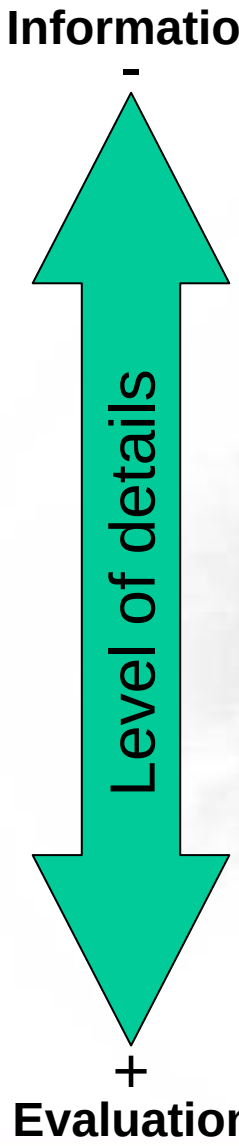
What do we Communicate in a scenario?



Elements that should be communicated by a scenario:

- Genre
- Purpose and Expected outputs
- Context
  - ➔ Time
  - ➔ “Scene” (Location, Decor…)
  - ➔ Characters (Actors, roles and responsibilities)
- Action
  - ➔ Event focus
  - ➔ Chain of Events
  - ➔ Rhythm

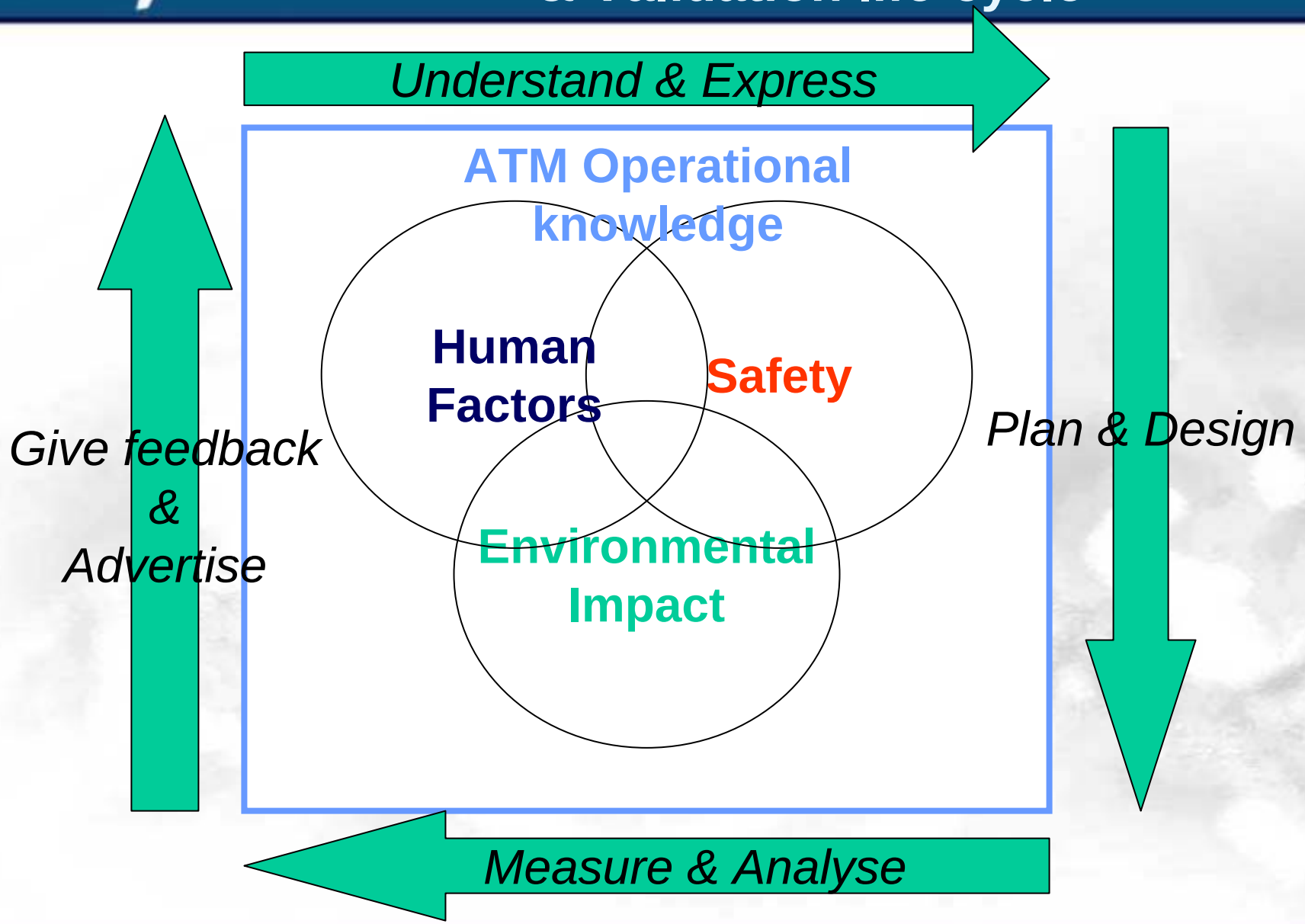
To Whom do we Communicate?



- Decision makers / Managers
  - ➔ Focus on the decision making variables (Generalisation, Cost, System Performances, Time of availability)
  - ➔ Validated (Yes/No)
- Public
  - ➔ Focus on Cost, Delay, Safety & Environment
- Actors of the ATM system (ATCOs & Pilots)
  - ➔ Focus on the operational aspects
  - ➔ Risk Management, Workload Management, & Level of Service
- Subject Matters Experts / Experimenters
  - ➔ Focus on the experimental aspects
  - ➔ Validity & Reliability

Scenarios are a means
to support
the overall validation life-cycle.

Scenario description language & Validation life-cycle



The appropriateness of the scenarios will be established by the experiment's participants and …

it can be harsh!

10 rules to write a scenario

1. Look for existing scenarios before “reinventing the wheel”; Make reference to them.
2. Determine the scenario’s purpose and the audience.
3. Choose a “method” to describe the scenario and stick to it.
4. Use the right level of information and the right type of representation according to the audience.
5. Stay focus on the purpose, don’t introduce irrelevant actors, O.I., events, …
6. Use short, effective and active sentences.
7. Present things in sequence and give timing indications as much as possible.
8. Prepare it well before the experiment and Prepare backup scenarios in case of…
9. Check it and make it check by several people before testing it (ATCOs, Pilot & SMEs).
10. Evaluate the results according to the purpose. Is there any unexpected results? Was that a good scenario?

Good tools
for scenarios' description
should support
the static and dynamic aspects of
the ATM system.

Using UML as a means to describe scenarios

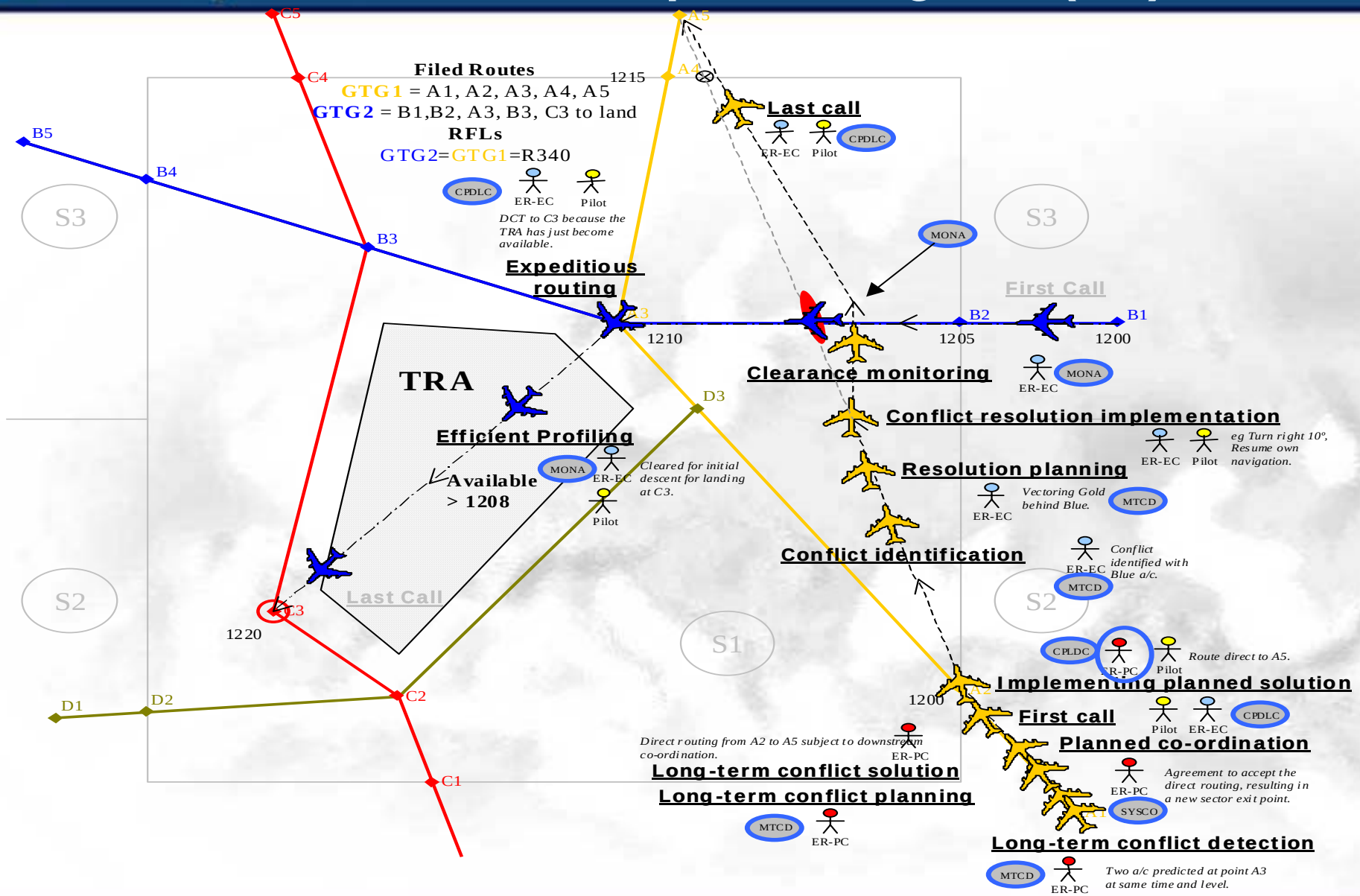
- UML (Unified Modelling Language) can be used a basis for a common scenario's description language.

- List of description tools:
  - ➔ Graphical diagram
  - ➔ Talk through description
  - ➔ Task Matrix

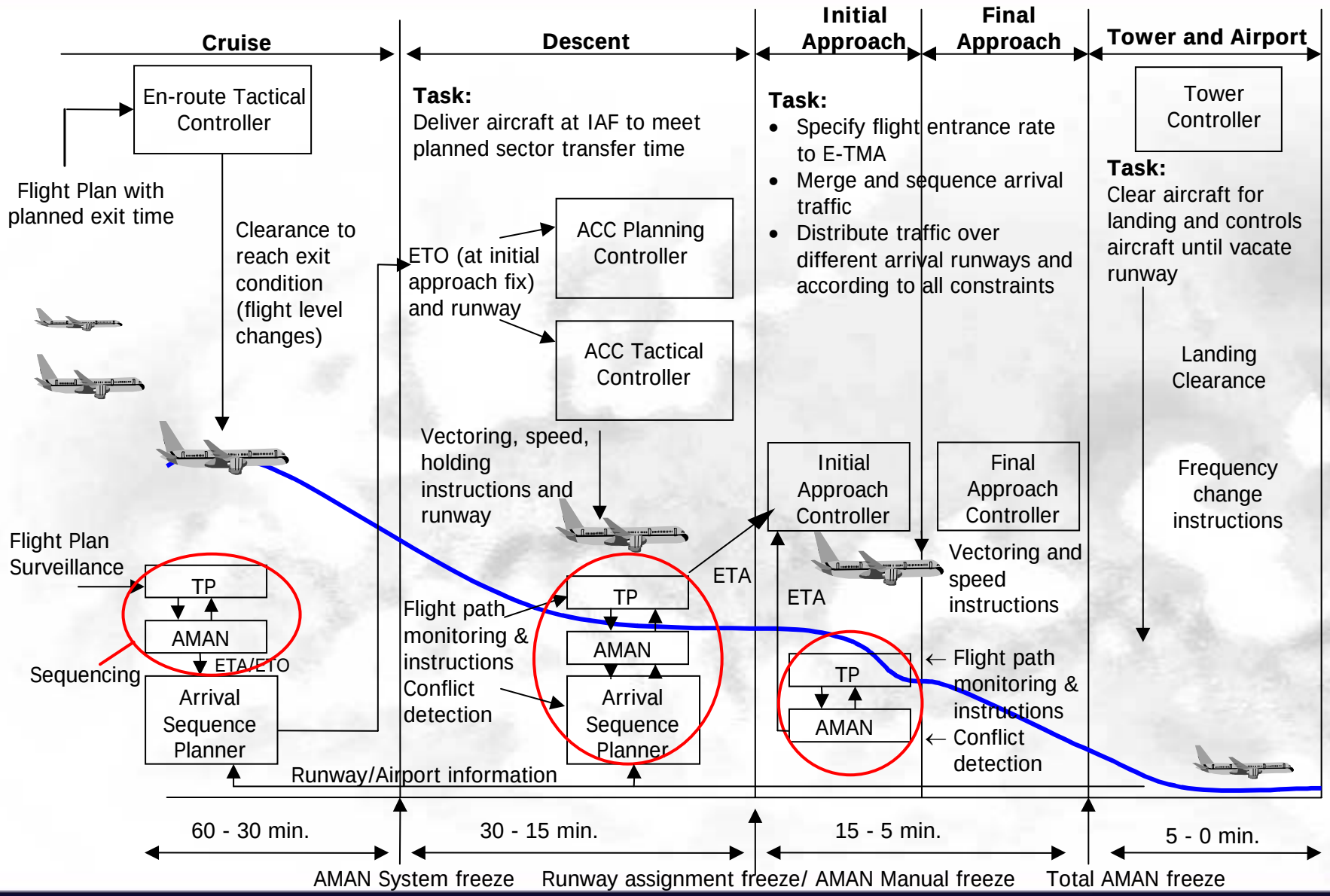
  - ➔ Context diagram (UML package diagram)
  - ➔ Progression diagram (UML sequence diagram)

- The examples provided come from a work done by Nicholas HUNT within the Gate-To-Gate project.

Graphical diagram (1/2)



Graphical diagram (2/2)



“Talk through”

The diagram is made from the Sector 1 viewpoint and represents this scenario:

- Sector 1 is an enclosed sector bordered on either side and to the south by sector 2, and on either side and to the north by sector 3. All sectors are en-route sectors, S1 has a TMA below for traffic routing to/from a small airport at point C3. Each sector contains an ER-PC and ER-EC, however unless otherwise stated ER-PC and ER-EC correspond to the respective actors in S1.

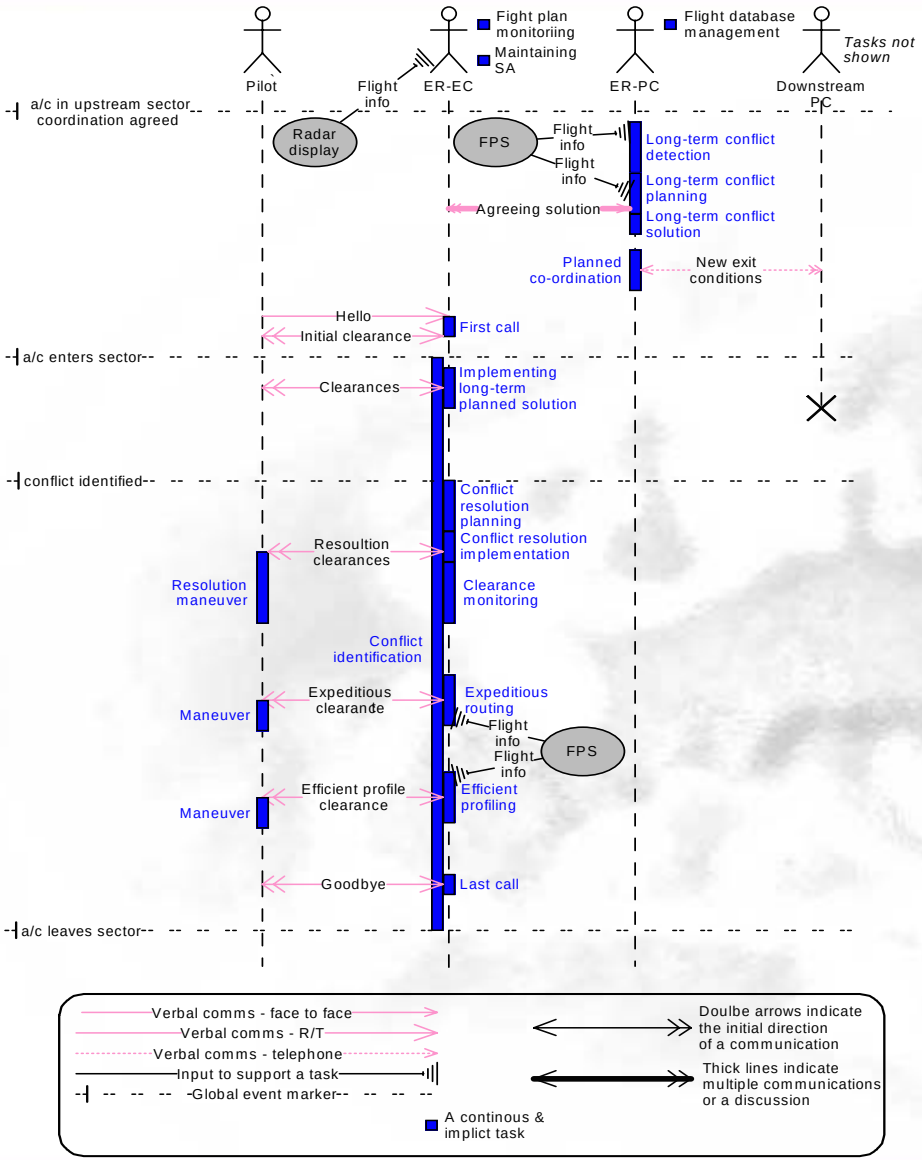
- GTG1, the gold aircraft, has a planned routing from point A1 along route A (gold route) to exit the sector at point A4, continuing on to point A5 and beyond. GTG2, the blue aircraft, has a planned routing from point B1 to point B3, before joining route C to land at point C3. Both aircraft are cruising at their RFL of FL340 and are of similar type. The TRA is active until further notice.

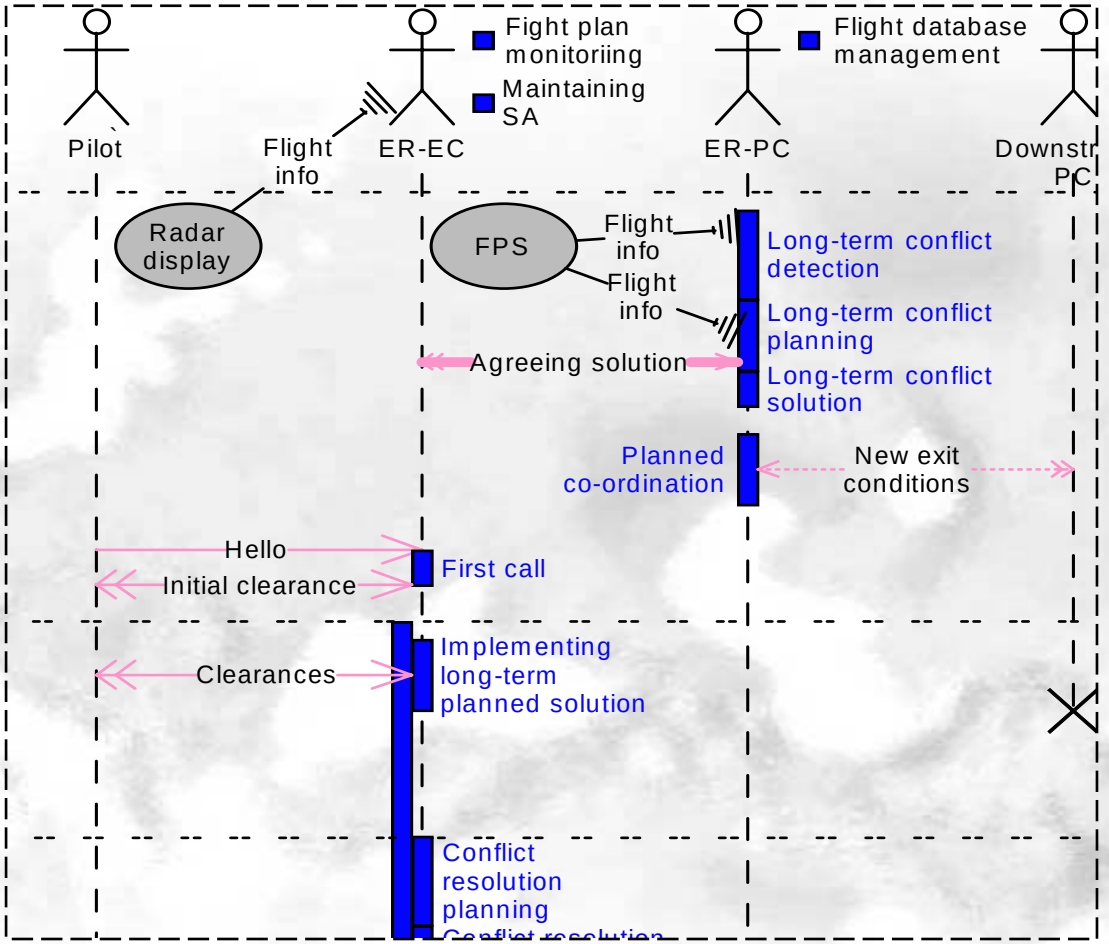
- The scenario begins with GTG1 in S2 approaching S1, and with GTG2 in S3 approaching S1. Both upstream sectors have a Letter of Agreement (LoA) with S1 and both aircraft are complying with the conditions of the agreement, hence no explicit co-ordination has been performed.

Configurations Tasks

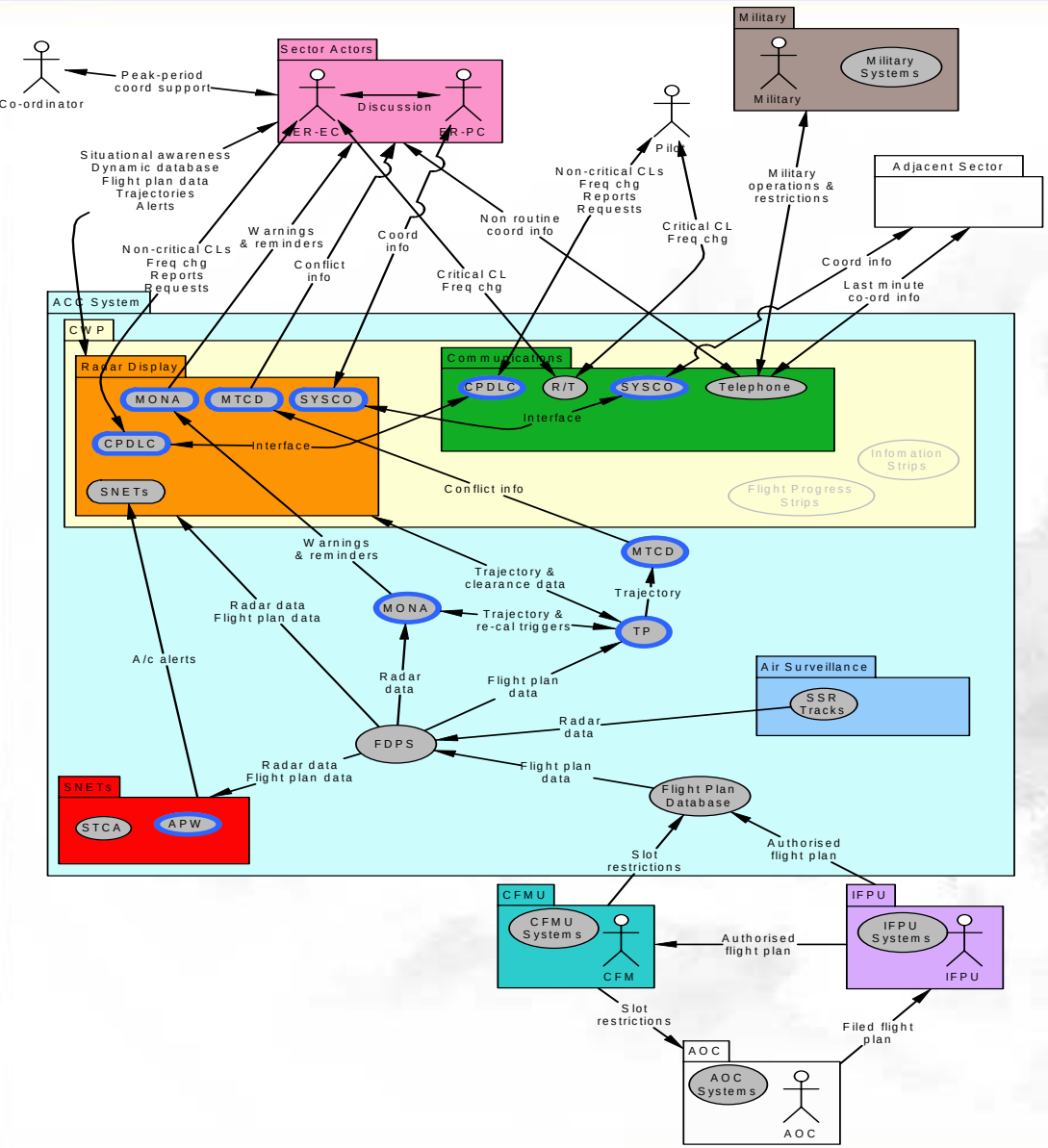
			Basic Baseline v0.7 ER-PC / ER-EC / CO					Advanced Baseline v0.1 SYSCO, MONA, MTCD, CPDLC ER-PC / ER-EC / CO				
			Main actor	Means of addressing the task	Other actors	Comms	Systems	Main actor	Means of addressing the task	Other actors	Comms	Systems
1	Maintaining Situational Awareness	Radar surveillance	PC/EC	Cognitive			Radar	PC/EC	Cognitive			Radar
2		Flight data surveillance	PC/EC	Cognitive			FPS	PC/EC	Cognitive			HMI
3		Communications monitoring	PC/EC	Cognitive		Ear		PC/EC	Cognitive		Ear	
4		Environment Awareness	PC/EC	Cognitive				PC/EC	Cognitive			
5	Provide optimum service to A/C	Expeditious routing eg. DCT	PC/EC	Cognitive				PC/EC	Cognitive			
6		Efficient profile eg optimal FL	EC	Cognitive				EC	Cognitive			
7	Flight Database Management	Flight information updates	PC	Cognitive	EC		FPS	PC	Cognitive	EC		HMI
8		Integrity checking	PC	Cognitive			FPS	PC	Cognitive			HMI
9		Estimate updates	PC	Cognitive			FDPS	PC	SYSCO??			TP??
10	Co-ordination	Planned co-ordination	PC	Cognitive	PC±	Phone / Speech		PC	Cognitive	PC±	SYSCO	
11		Radar handover	EC		EC±	Phone / Speech		EC	Cognitive	EC±	Phone / Speech	
12		Peak period co-ordination support	CO	Cognitive	EC± PC±	Speech		CO	Cognitive	EC± PC±	Speech	
13	Conflict Search	Long-term detection	PC	Cognitive			Radar / FPS	PC	MTCD			TP
14		Intra-sector identification	EC	Cognitive	PC	Speech	Radar	EC	Cognitive / MTCD	PC	Speech	Radar / TP
15		Alert Response	EC	STCA / APW			Radar	EC	STCA / APW			Radar
16	Planning of conflict solutions	Long-term	PC	Cognitive			Radar / FPS	PC	Cognitive / MTCD			TP / Radar / HMI
17		Intra-sector resolution	EC	Cognitive			Radar	EC	Cognitive / MTCD			TP / Radar
18	Communication of clearances	Conflict resolution implementation	EC	Cognitive	Pilot	R/T		EC	Cognitive	Pilot	R/T	
19		Implementing long-term planned solutions	EC	Cognitive	Pilot	R/T		EC	Cognitive	Pilot	CPDLC	
20		Expeditious routing	EC	Cognitive	Pilot	R/T		EC	Cognitive	Pilot	CPDLC	
21		Efficient profile	EC	Cognitive	Pilot	R/T		EC	Cognitive	Pilot	CPDLC	
22	Deviation from flight track monitoring	Clearance monitoring	EC	Cognitive			Radar / FPS	EC	MONA			TP
23		Flight plan monitoring	EC	Cognitive			Radar / FPS	EC	MONA			TP
24	Other Communication	First Call (Hello)	EC	Cognitive	Pilot	R/T		EC	Cognitive / SYSCO	Pilot	CPDLC	
25		Last Call (Goodbye)	EC	Cognitive	Pilot	R/T		EC	Cognitive / SYSCO / MONA	Pilot	CPDLC	
26		Requests	EC	Cognitive	Pilot	R/T		EC	Cognitive	Pilot	CPDLC	
27		Reports	EC	Cognitive	Pilot	R/T		EC	Cognitive	Pilot	CPDLC	
28	Suite configuration management	Workload assessment	EC	Cognitive	CO/PC	Speech		EC	Cognitive	CO/PC	Speech	
29		Suite/ACC Configuration	CO	Cognitive				CO	Cognitive			

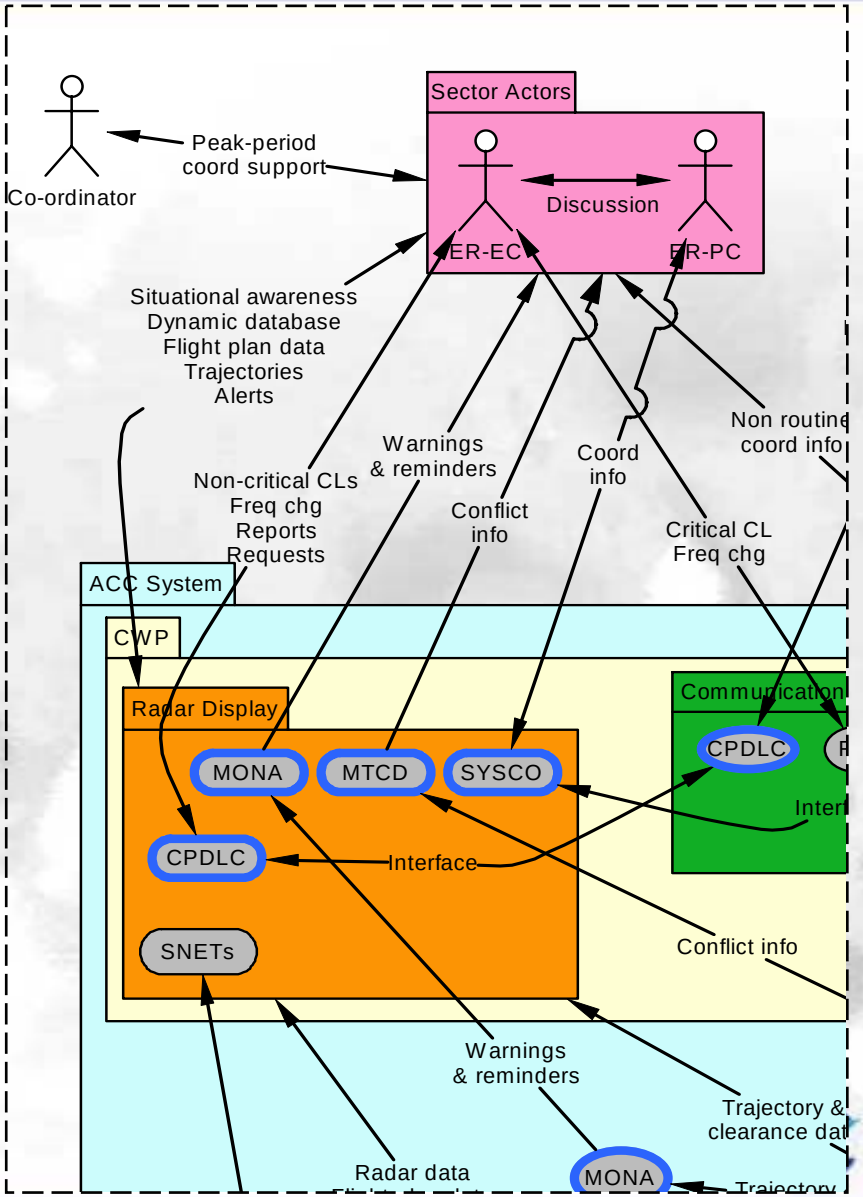
Progression diagram





Context diagram





Validation documents workflow

Ops Concept Descriptions
Dx.1.2.1 July 03

Overall, high level Concept descriptions
Business View
Problem
Solution
Enablers
Constraints
Expected Benefits
Stakeholders
Operational Environment
Assumptions

Principles of Operation
(part of Dx.1.2.1) July 03

Concept Configurations (in line with planned experiments)
Operational Focus
Task Descriptions
Use cases

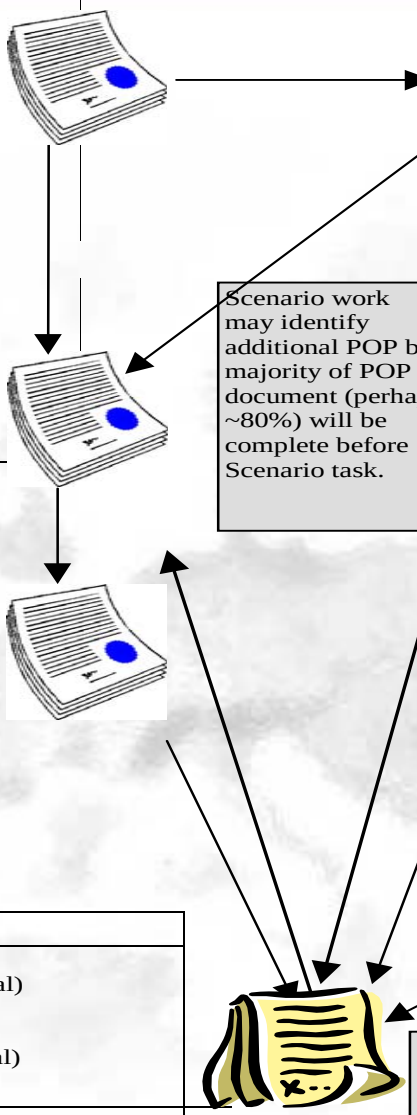
Application Descriptions
Not identified

For each configuration:
Roles and Procedures
Phraseology
HMI Options
Functionality
Concept Scenarios

These aspects need to be identified somewhere

Test Scenarios

Concepts/Configurations
Objectives (of Scenario and Val)
Assumptions tested
Indicators and metrics
Events (normal and non-normal)
Actors involved
Traffic characteristics
Airspace characteristics
Specific Platform requirements



Scenario work may identify additional POP but majority of POP document (perhaps ~80%) will be complete before Scenario task.

These two documents are closely linked.

Overall Validation Strategy
D0.4.1 Jan 03

Overall Validation Aim and High Level Objectives
List of Concepts included in Assessments
List of ALL planned experiments on ALL concepts
Who / What / Where / When of experiments

Refine objectives balancing capabilities and needs

WP Validation Strategies and Plans
Dx.4.1.2 Dec 03 / Jan 04

Extension of info contained in D041
Experimental Strategy on an Applications or WP basis.
Refined Objectives (based on new strategy etc)
Configurations for each experiment
Level of maturity
Platform
Who / What / Where / When of experiments

Consolidated Validation Strategy and Plan
D0.4.3 Feb 04

Consolidation of information in individual WP Validation strategies and plans
A review of the overall validation strategy (for coverage and consistency)

Experimental Plan
Internal deliverable

Plan for each individual experiment in the strategy
Objectives of that experiment
Measurement Spec
Number of exercises
Scenarios Used
Organisations
Airspace
CWPs

End of the presentation.

Discussion